SUPPORT FOR THE AMENDMENT

This Amendment amends the title; and amends Claims 10 and 19. Support for the amendments is found in the specification and claims as originally filed. In particular, support for the title is found in the specification at least at page 5, line 5. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1-20 will be pending in this application. Claims 1 and 3 are independent.

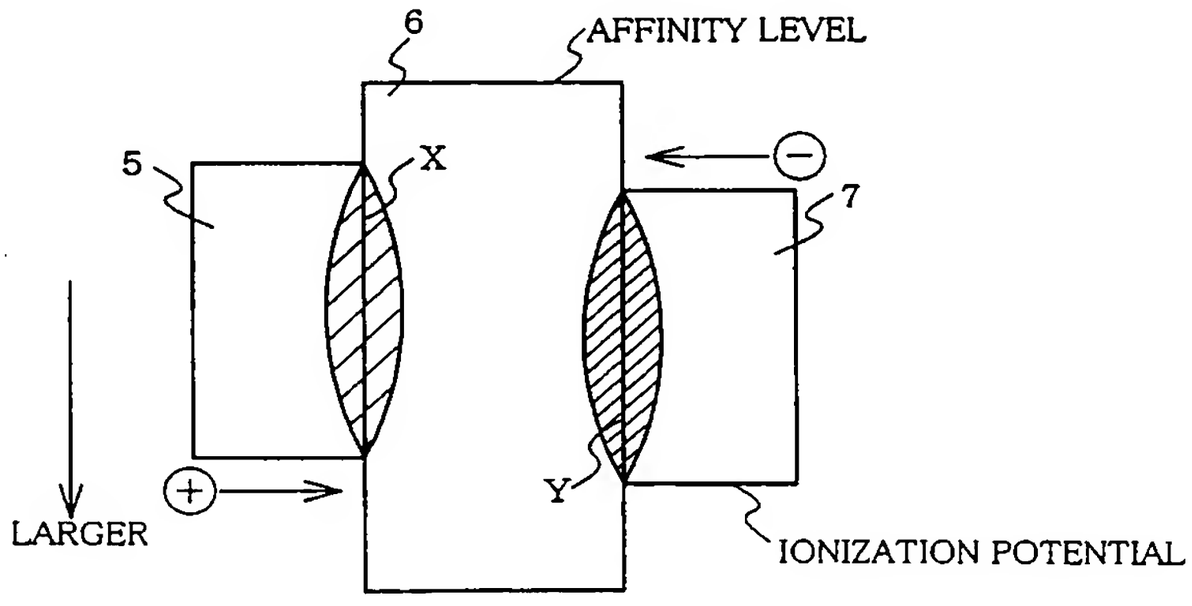
REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

The present invention provides a white organic EL device, with a high luminous efficiency and small change in chromaticity, by interposing a carrier barrier layer between two organic emitting layers and controlling the energy levels of the layers. Specification at page 2, lines 23 to page 3, line 4; page 5, lines 4-6.

> [0013]
> Fig. 2 shows energy levels of the first emitting layer 5, electron barrier layer 6 and second emitting layer 7 of the organic EL device 1. In this Figure, upper sides represent the affinity level of electrons, and lower sides represent ionization potential. In the energy level diagram, a lower portion exhibits a greater value. Specification at page 6, lines 16-22.

FIG. 2



Claims 1-2, 5-9 and 11-13 are rejected under 35 U.S.C. § 102(b) over U.S. Patent Application Publication No. US 2004/0032214 A1 ("Lee"). Claim 10 is rejected under 35 U.S.C. § 103(a) over Lee.

Lee discloses a white light-emitting organic electroluminescent element comprising an anode; a hole injecting layer; a hole transporting layer; an organic electroluminescent layer consisting of two or three color light-emitting layers and one or more controlling layer, the controlling layer being made of a blocking material for controlling the stream of electrons between the light-emitting layers; an electron transporting layer; and a cathode. Lee at [0012]. Lee discloses that a controlling layer 45 may be present at all positions between blue, green and red light-emitting layers 44, 49, 50, or at any one position between them. Lee at [0032]. Lee discloses that an organic electroluminescent material for emitting green light may be Alq3, an organic electroluminescent material for emitting blue light may be DPVBi, and an organic electroluminescent material for emitting red light may be CDJTB doped Alq3. Lee at [0030]. Lee discloses that α-NPD is most preferable as blocking material for the controlling layer. Lee at [0033]. The OLED of Lee comprises a first emitting layer of Alq3, a carrier barrier layer composed of α-NPD (=NPB) and a second emitting layer composed of DPVBi or CDJTB doped Alq3.

Journal of Applied Physics, 100, 083111 (2006) ("Su-Hua Yang")(copy attached) discloses the ionization potentials and affinity levels of Alq3, α-NPD (=NPB), DPVBi and CDJTB doped Alq3 in FIG. 2, reproduced below.

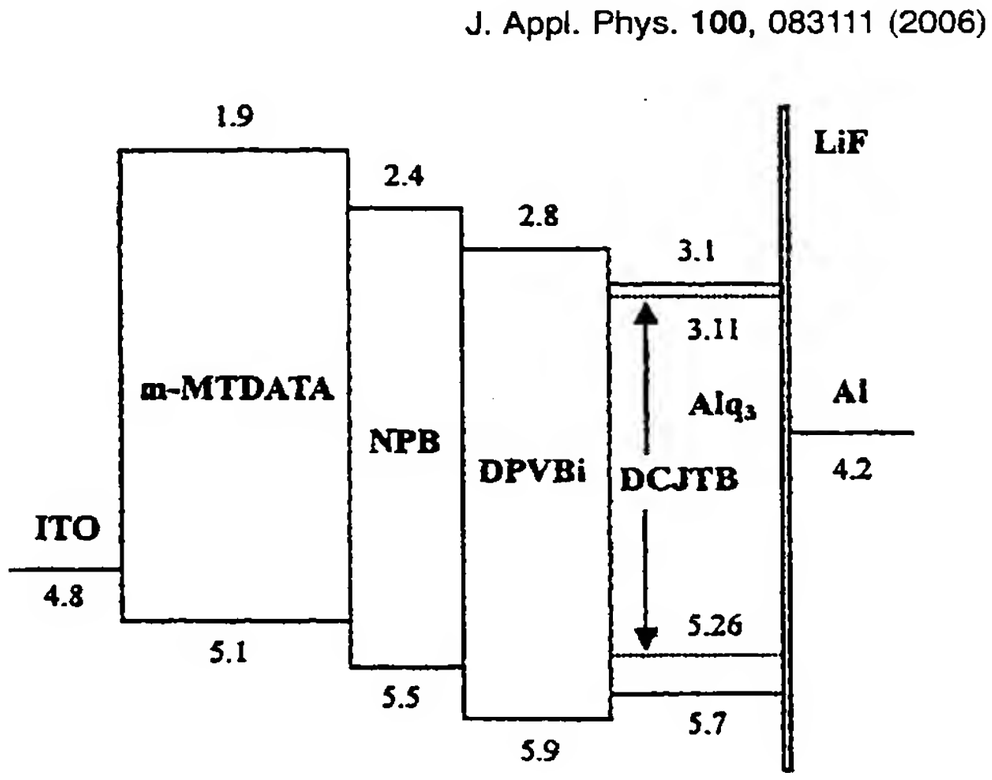
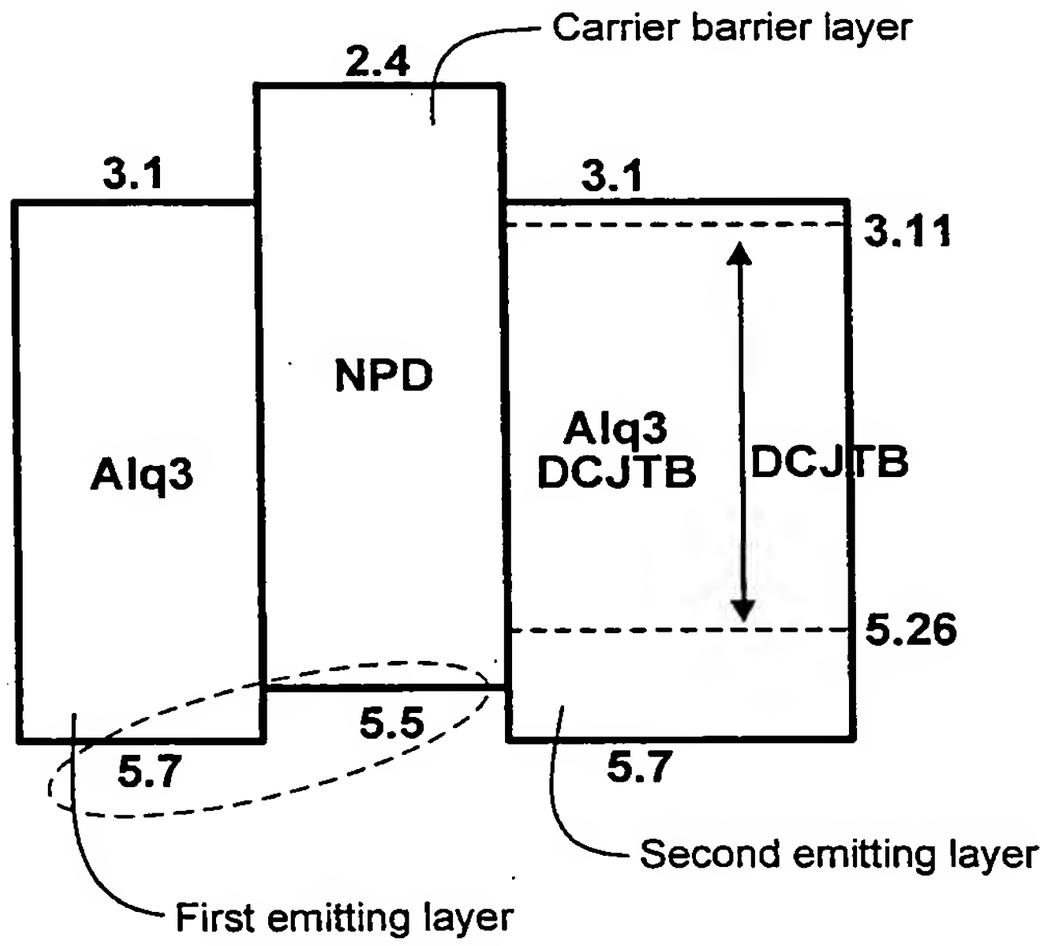


FIG. 2. Energy-level diagram of the WOLED.

Lee's organic electroluminescent device is reproduced below, using the energy levels of Su-Hua Yang.



The ionization potential of 5.5 of Lee's carrier barrier layer is ***less*** than the ionization potential of 5.7 of Lee's first emitting layer.

Lee fails to disclose, expressly or inherently (i.e., necessarily), the independent Claim 1 limitations that "the ionization potential of the carrier barrier layer is **more** than the ionization potential of the first emitting layer by 0.1 eV or more and the affinity level of the carrier barrier layer is less than the affinity levels of the first emitting layer and the second emitting layer by 0.1 eV or more".

Thus, the rejection under 35 U.S.C. § 102(b) over Lee should be withdrawn.

Claims 3-4 and 14-20 are rejected under 35 U.S.C. § 103(a) over Japanese Patent Publication 2002-313553 ("Omori") in view of U.S. Patent No. 7,022,421 ("Thompson").

Omori discloses an organic EL element comprising a lower transparent electrode 1, a hole transport layer 2, an electron barrier layer 3, a luminescent layer 4, a hole barrier layer 5, an electron transport layer 6 and a counter electrode 7 formed in this order on a polymer optical waveguide substrate. Omori at abstract. Omori discloses that electrons and holes are shut up in the luminescent layer 4 by the electron barrier layer 3 and the hole barrier layer 5. Omori at abstract.

Omori discloses:

> [0024]Drawing 2 is a figure showing the lamination of the high-speed operation organic EL device 201 which are other embodiments of this invention. A figure is a sectional view seen from the direction parallel to the polymer optical waveguide board 202 used as a substrate. The high-speed operation organic EL device 201 on the polymer optical waveguide board 202, It is formed in order of the lower transparent electrode 1, the electron hole transporting bed 2, the **1st electron barrier layer 3a**, the **1st luminous layer 4a**, the **1st hole barrier layer 5a**, the **2nd electron barrier layer 3b**, the **2nd luminous layer 4b**, the **2nd hole barrier layer 5b**, the electron transport layer 6, and the counterelectrode 7. ... English-language machine translation of Omori at [0024] (emphasis added).

The Office Action at page 7, lines 17-20, admits that "Omori fails to disclose wherein the ionization potential of the first carrier barrier layer is more than the ionization potential of the first emitting layer by 0.1 eV or more and the affinity level of the second carrier barrier layer is less than the affinity level of the second emitting layer by 0.1 eV or more".

Thompson discloses organic light emitting devices having carrier blocking layers comprising metal complexes. Thompson at title. However, Thompson only discloses an organic light emitting device having one emitting layer (e.g, column 22, lines 28-41).

Thompson discloses that the layer adjacent to a hole blocking layer is a "layer in which holes are to be confined", and that differences in LUMO energy levels between the two layers can be less than about 500 meV. Thompson at column 13, lines 43-48.

Thompson discloses that that the layer adjacent to an electron blocking layer is a "layer in which electrons are to be confined", and that differences in HOMO energy levels between the two layers can be less than about 500 meV. Thompson at column 14, lines 31-36.

In contrast, in the present invention, some holes which are injected into the first emitting layer move to the second emitting layer through the electron barrier layer, and some electrons which are injected into the second emitting layer move to the first emitting layer through the electron barrier layer. Specification at page 7, lines 1-18. This is because two emitting layers which sandwich a carrier barrier layer cannot emit simultaneously unless some holes and electrons pass through the carrier barrier layer.

Therefore, if holes and electrons are "confined" to a layer, as in the layers adjacent to Thompson's blocking layers, two or more emitting layers cannot emit simultaneously.

Because Thompson's blocking layers prevent simultaneous emission of two emitting layers, there is no reasonable expectation that the cited prior art would have led the skilled artisan to the independent Claim 3 limitations of an "organic electroluminescent device

comprising ... a first emitting layer, a first carrier barrier layer, a second carrier barrier layer, a second emitting layer ... ; wherein the ionization potential of the first carrier barrier layer is more than the ionization potential of the first emitting layer by 0.1 eV or more and the affinity level of the second carrier barrier layer is less than the affinity level of the second emitting layer by 0.1 eV or more".

Thus, the rejection under 35 U.S.C. § 103(a) over Omori in view of Thompson should be withdrawn.

Claims 10 and 19 are rejected under 35 U.S.C, § 112, second paragraph, and are also objected to. To obviate the rejection and objection, the term "the other emitting layer" is replaced with --another emitting layer--.

Applicants respectfully request that the Examiner acknowledge consideration of the AY reference cited in the Information Disclosure Statement filed April 7, 2006, by initialing the associated Form PTO-1449.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

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Attached:

Journal of Applied Physics, 100, 083111 (2006) ("Su-Hua Yang")